The Michigan Antique Radio Chronicle

www.michiganantiqueradio.org

A QUARTERLY WRITTEN FORUM OF THE MICHIGAN ANTIQUE RADIO CLUB

VOLUME 34 Summer 2019 NUMBER 2

Find anything you want at the

Vintage Electronics Expo / EXTRAVAGANZA '19

July 18-20, 2019

THE MICHIGAN ANTIQUE RADIO CLUB

The Michigan Antique Radio Club was founded October 19, 1985 at the Dillon Inn in Lansing, Michigan. Present at this historical meeting to found MARC were Jim and Brenda Clark, Larry Anderson, Karl Rommel, Mike Male, Dick Perry and John Kent. The purpose of the organization is to preserve the history and enhance the knowledge of radio, television, and related disciplines, with special emphasis on contributions originating in the state of Michigan. Dues for membership in M.A.R.C. are $25.00 annually (US funds) and payable in January. Officers of M.A.R.C. welcome your membership, your questions and your personal contributions to enhance the service value, growth and activities of the organization. Terms of office for Board members expire concurrently with the summer EXTRAVAGANZA meet held in Kalamazoo, Michigan. Send Correspondence to MARC, 311 Wordsworth St., Ferndale, MI 48220. E-mail: president@michiganantiqueradio.org. **Visit our Web site at** www.michiganantiqueradio.org.

President: Jeff Lilly, 311 Wordsworth St., Ferndale, MI 48220, 248-602-7513, rackofhats@gmail.com

Vice President: Ian Shackleford, PO Box 359, Conway, MI 49722, 248-860-6634, ishack@sbcglobal.net

Treasurer: Mark Goodwin, 9225 Moon Rd., Saline, MI 48176, 734-944-0730, mrkgoodwin@comcast.net

Rec. Secretary: Sally Reinicke, 7458 St. Auburn, Bloomfield, MI 48301, 248-626-4895, sreinicke@comcast.net

Mem. Secretary : Jim Ehlers, 21891 Hampton St., Beverly Hills, MI 48025, 317-997-3509, james.ehlers256@yahoo.com

Trustee: John Reinicke, 7458 St. Auburn, Bloomfield, MI 48301, 248-626-4895, jreinicke@comcast.net

Trustee: Mike Dale, 3464 Judd Rd., Milan, MI 48160, 734-439-0834, mdale8@peoplepc.com

Trustee: Nancy Colbert, 22400 Nowlin, Dearborn, MI 48124, 313-274-1948, njcolbert9@comcast.net

Trustee: Dan Gutowski, 9753 Easton Rd., Dexter, MI 48130, 734-433-1354, dg16ms26@msn.com

Trustee: Dick Jones, 7050 Talladay Road, Milan, MI 48160, 734-461-9766, dcjpjones@aol.com

Trustee: Bryan Wilemon, 9320 Quandt, Allen Park, MI 48101, 313-382-2147, abpushpull@att.net

Trustee: Bob Dobush, 126 S Main, Wellington, OH 44090, 216-346-3908, bobtheatre@aol.com

Trustee: Mark Mokris, 2161 Orchard View, Ann Arbor, MI 48108, 248-763-0381, mark.mokris@gmail.com

Media Director: Mark Oppat, 253 Blanche St., Plymouth, MI 48170, 734-455-4169, moppat@comcast.net

Web Master: Leann Meixner, 253 Blanche St, Plymouth, MI 48170, 734-455-4169, bluesthecat@gmail.com

Chronicle Editor: Steve Enzer, 12740 Monroe Pike, Brooklyn, MI 49230, 517-592-2841, enzer@binsys.com

THE MICHIGAN ANTIQUE RADIO CHRONICLE is a forum of the Michigan Antique Radio Club. It is published four times a year. Annual subscription fees and one classified advertisement per issue are included in paid membership dues. Articles of interest to collectors of items pertaining to vintage radio and television technology and communications are welcome. Reprinting, in any form, of individually copyrighted material published in this newsletter requires the permission of the author. If not cited with a "©", articles may be reprinted without specific permission but should include the name of the original author and publication. *THE MICHIGAN ANTIQUE RADIO CHRONICLE* is published in Brooklyn, Michigan. Circulation is dependent upon membership and exchanges. Currently, it approximates 600 copies. Articles and advertisements may be addressed to the Editor.

The Michigan Antique Radio Club is willing to assist in the sale of estate collections of antique radios and other collectable electronic items. For information, please contact either Mark Oppat at 734-455-4169 or Jeff Lilly at 246-602-7513.

EXTRAVAGANZA '19 will be held July 18-20, 2019 in Kalamazoo.
Note that this is a week later than previous years.

Perspectives

I used the entirety of last issue's space telling you about all of the exciting changes and additions we're putting in place for Extravaganza '19. As a result, I completely neglected a few other important things!

First off… the Winter VEE 2019 was successful, again, beyond our expectations. Last year we had over 800 in the door, and we all agreed that was amazing. Well, this year, we did better—over 1100 people attended the show! The place was packed all day, the silent auctions were hopping, and I hardly had a chance to speak to many of you as I wanted, but wow, what a show! A shout out to the valiant women at the registration desk, Sally, Nancy, and Angela, who have handled the steadily-increasing workload with skill and aplomb. Mark Oppat has written up a longer recap of the Winter VEE in this issue, so check it out.

We would like to give a hearty welcome to our new Membership Secretary, Jim Ehlers. Jim agreed to step up to the plate, despite his busy schedule, and bring his great organizational skills to the club. We really appreciate it!

On that note, some of you have contacted me or gotten in touch via the website to let us know about problems with your memberships, mainly issues of slower response time and uncashed or misplaced checks. The transition from one membership secretary to another will always have a few bugs, especially when handing over physical records and documents over a pretty substantial distance. We appreciate your patience as we wrap up this transition. Please send all correspondence / membership inquiries to Jim Ehlers from now on.

We're ramping up for Extravaganza '19 and putting the finishing touches on the plans for the show. If you haven't already, mark your calendars for the 18th, 19th, and 20th of July. We will be featuring our usual swap meet, Friday auction, two silent auctions on Saturday, and the donation auction / Good Buy Affair at the end of the show on Saturday. We will have our usual big contest and guest speakers / demonstrations (check website for details.) The President's Reception will be Friday night at the Sheraton, where we will have refreshments, a cash bar, show and tell presentations (please let us know if you have something you'd like to share) and awards presentations.

In addition to the block of rooms at the Four Points by Sheraton, we have arranged for an additional block at the Clarion Inn. You can access the discounted rates by mentioning Extravaganza '19. Please contact the hotels directly to make your reservations. Blocks will be held until the 18th of June so please make your reservations soon.

Four Points by Sheraton: (269) 385-3922. Clarion Inn Kalamazoo: (269) 381-1900.

You can also "rough it" at this year's show. The Expo Center has outdoor tent camping spaces and RV / trailer hookups available. Outdoor sites include secure fencing, electrical, showers, modern restrooms, and trash disposal. For more information or to reserve a camping / RV space, please contact the Expo Center directly at (269) 383-8778.

As noted before, in addition to our regular indoor spaces in air-conditioned comfort, we will be offering outdoor selling spaces at Extravaganza '19. Please check the brochure or website for pricing and call with any questions.

We hope you have a great summer, and look forward to seeing you in Kalamazoo in July!

Jeff

NOTES FROM THE SERVICE SHOP

No. 106

by John Reinicke

Metal Detectors, Wiggy, and Other Kinks

© 2019 by John Reinicke

My trip to Centerburg had been uneventful and even though I had arrived after Ken and Betty had closed for the night, the late sunset afforded me a chance to walk around town. The area around the square was busy with folks going to the restaurants and enjoying the pleasant evening. A dipped soft serve ice cream cone provided me a nice nightcap for the day.

As I walked back to Ken and Betty's shop, I pasted their annex store next door to the Antique Shop and was surprised to see a display of classic red kerosene lamps in the window. What caught my eye was not so much the display as the fact the lamps, chairs and wooden boxes in the window were, as we say, 'barn fresh' – covered with a layer of grime. I found this interesting and a bit puzzling and made a note to bring up the display when I saw them in the morning. I used my key in the back door to make my way to camp out in the old apartment above the store.

The next morning found me in the room at the back of Ken and Betty's shop enjoying lively conversation along with a breakfast of carryout from the square and Betty's robust coffee. After the usual exchange of family gossip I brought up the interesting display in the window of the annex.

Betty laughed when I did. "You know, there is really an interesting tale about that."

Her animated response made me grin and wave my hand as I responded with "And ?"

"That display is the brain child of Ivy, one of our college part timers. She is studying business and has quite a knack for 'reading' people. As you know, with the busloads of tourists that stop in town in the summer, we want to have some reasonably priced items in the store. The objective would be to be sure that anyone that walks in the door would purchase something as a souvenir and we are pretty good at that. Anyway, Ivy happened to be down at the warehouse south of town to help unload a truckload from a picking expedition. She took note of the layer of grime on a lot of the load and decided that the grime was a sort of patina and had a sort of charm of it's own.

"She talked me into putting a small display in the front window of grimy stuff

to show folks how we find things and, presumably, give them an idea of how we clean things up for sale. To our surprise, we discovered that people wanted to buy things right out of the display, grime and all. I suppose it gave them some of the thrill of discovery and the notion this would be a real bargain.

"Those kerosene lamps are a particularly interesting example. On one of our picks, we encountered an old warehouse that had a couple of hundred of them stored on several shelves. As near as we can guess, they were new sometime in the 50's and had been sitting there ever since. They were, and are, covered with a layer of grime. As you probably know, you can still buy new classic kerosene lamps for around 10 bucks. They can be used with modern lamp oil and provide a romantic light brighter than a candle. If you don't mind the fumes, they are a bit brighter burning kerosene. Anyway, as you see, we keep a few in the window and with the grime they will fetch 20 bucks. I'll bet the ones you saw last night will be gone by closing tonight."

I grinned. "Dare I ask what you paid for them?"

Betty smiled back. "We got the whole lot for a quarter a piece! Of course, we did have to load them up and that is the first time I can remember being careful to not disturb the grime."

I couldn't resist a wisecrack; "I don't suppose you have considered buying a bunch of new ones and parking them in the warehouse to pick up grime. You could put vintage labels on them like wine."

Ken and Betty both chuckled at the suggestion and we all agreed the fad would certainly pass. Our morning exchange continued until Ken and Betty had to open for the day. With a fresh cup of coffee in hand, I made my way to the front of the attic to settle into the chair at the old roll top desk and read from the diary and logbook of Clemens Mettmann, who had run a radio TV shop in the building in decades past. I stepped into Clem's time machine into the middle of the 20th century.

It was a beautiful early summer day just before the shop would open. The sun was pouring in the big front windows and Darcy was at her desk preparing invoices to mail. Clem and Gerry were in the shop in the back room. Clem was finishing up on a TV chassis that he was going to return and Gerry was tuning up a couple of two-way radios for the Sheriff's office. The two of them looked up as Art came in the back door.

Art was carrying a rather interesting object. At one end was a aluminum Bud box about the size of a cigar box. A pole extended from one end of the box for about a yard and ended in a round coil. A pair of wires ran up the pole from the coil to the box. The box had a switch, two knobs and a headphone jack. A carrying handle on the box completed the interesting device. Art carried the gizmo over to his bench and propped on the wall behind. His next stop was the coffee pot and as he carried his cup back to the bench it would be Clem that would be first to comment.

"So, Mister Miller, are you planning to tell us about that contrivance or is it some top secret space communications transponder?"

Art laughed at Clem's good-natured jab. "I suppose I could tell you it was just that, but it is not. It is, in fact, a type 2 metal detector. For our family vacation, we are planning to visit some Civil War battle sites and I thought it might come in handy to see if I could find anything interesting. I could take it to beaches in

the Carolinas and look for pirate treasure. Goodness knows what I could find."

Gerry looked up and asked, "Does it work? Have you tried it out yet?"

Art responded, "As a matter of fact it does work. I tried it out last night in the square and I managed to find half a dozen bottle caps, somebody's back door key and a nickel."

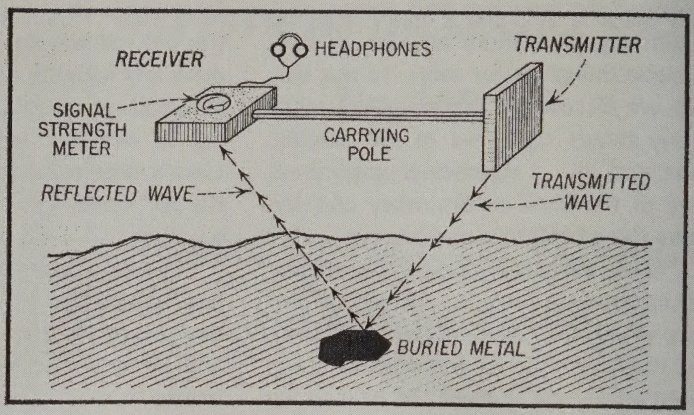


Fig. 1. Operation of Class-1 Locator.

Clem was grinning , "I suppose the fortune in treasure will have to wait. You said it was a type 2 metal detector. That makes me think you must have done some research into metal detectors. So how does it work and what is a type 1 detector?"

Art was enjoying the roll shift and his pleasure as the 'professor' showed. "As you guessed there are two types of metal detectors and both were developed during the war for use as mine and ordnance detectors. The first type has a transmitter located at one end of a pole and a receiver at the other end. The pole would be carried horizontally. The transmitter output is a coil that is carefully arranged to be at 90 degrees to the receiving coil. If there is no metal in the area, the signal from the transmitter will be nulled out by the 90 degree orientation of the coils. However, if there is any electrically conductive material in the area, the signal will be reflected to the receiver.

"A type 1 detector is quite sensitive and sees use today by utility workers looking for buried water or power lines. These work best if the frequency is around a hundred Kilocycles. As a mine detector, the type 1 has a shortcoming. To carry the detector, the balance point is in the middle of the pole. The peak signal will be when the metal is midway between the transmitter and receiver. If you are using this as a mine detector, this would put the peak response with the operator standing right on top of the mine – clearly not the best method.

"A type 2 detector utilizes a search coil located at the end of a pole thus keeping the operator a pole length away from a detected mine. The type 2 is not as sensitive, but the advantage is obvious. A type two detector uses two oscillators. One is connected to the search coil, which is used in the oscillator tank circuit. The second oscillator is tuned to the same frequency and the two are combined in a beat frequency detector that goes to an audio amplifier and a set of headphones. If the search coil is close to metal, the metal will detune the oscillator and you can hear the beat in the headphones. The closer you are to the metal, the greater the shift in frequency and the higher the pitch in the headphones. My detector has two controls, one for volume and one to trim the fre-

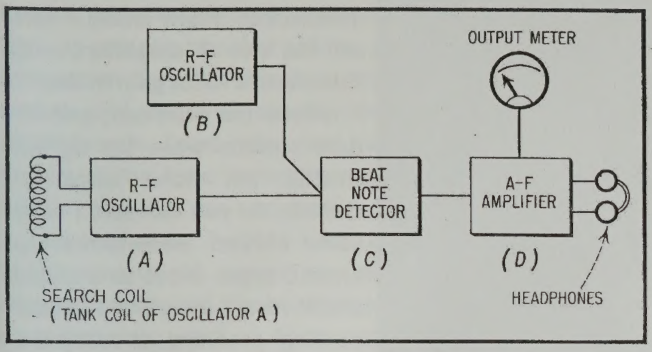


Fig. 2. Basic Arrangement of Class-2 Locator.

quency of the beat oscillator. For my beat oscillator I used an oscillator coil from an old radio and my detector works at 1600 or so Kilocycles. It does cause interference with the AM band but the power output is quite low. My frequency trimmer also allows me to adjust for a constant whistle in the headphones. If the search coil is near ferrous metal, the frequency will go down and if it is near a non-ferrous metal, like brass, silver or better yet, gold, the frequency will go up. This would give me the opportunity to ignore bottle caps. As a practical matter, the constant whistle is annoying so I just set it for zero beat."

Art reached into his back pocket and produced a sheet of paper that he carefully unfolded. "This is my detector schematic. As you can see, it uses a 1U4 as a search oscillator and a 1U5 as a mixer oscillator, just like a radio. A second 1U4 is the audio amplifier."

One could see that Gerry and Clem were impressed. It was Clem that was first to respond. "Art, that is really well done. I hope you do find real treasure with it. In the mean time, however, you could use it this afternoon to help me find the water cut off for the shop. I am planning to replace a pipe in the basement and knowing its location might be very useful."

Clem pointed to Art's bench. "I see you are working on Mrs. Jones's Detrola. That thing is almost old enough to vote, but she really does like it. How go the repairs?"

Art put his schematic in one corner of his bench and responded. "The repairs are going, OK, I guess. I discovered that the chassis mounted resistor in the B plus supply had opened up. I know that the replacement part can be hard to find. I also know the problem is probably due to corrosion where the terminals are crimped onto the wire wrap inside the insula-

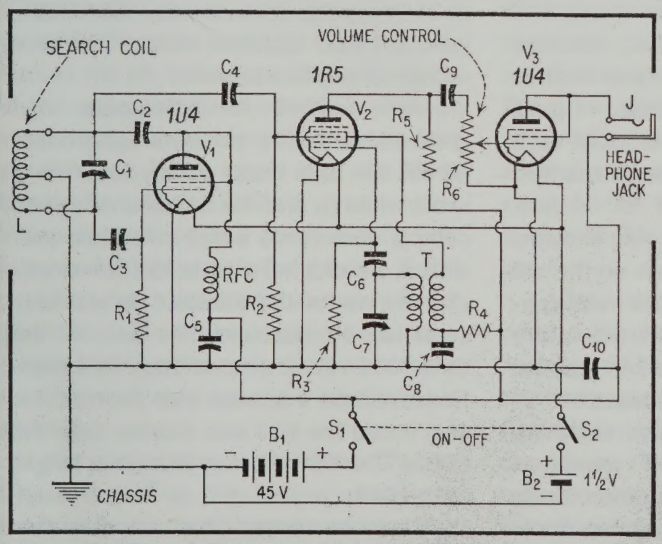
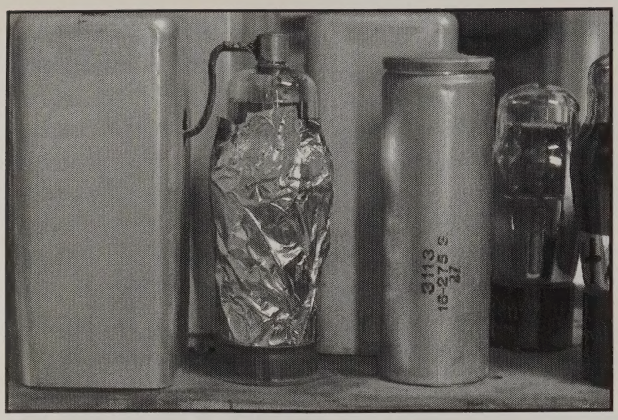


Fig. 4. Complete Schematic of Class-2 Metal Locator.



Detrola shield trick

tor. On some of my old sets, I have found that I can squeeze the outside can at the terminal point with my needle nose pliers and restore contact. That is OK for me on my own radio, but for a customer I wouldn't want to do a repair that might fail in a day or so.

"I thought about this for a while. The bad resistor is soldered on the chassis and it would require the good 'ol American Beauty soldering iron to remove it. I would then install three single terminal, terminal blocks to provide a connection for the two replacement resistors. Rather than remove the old resistor and drill three holes in the chassis, I decided to use the terminals on the bad resistor as anchors for terminal blocks. I used two positions of a terminal block at each terminal and soldered one to the bad resistor and used the other for connection to the new resistor. I also thought about just using the terminals on the old resistor as terminal blocks, but I was concerned that at some time in the future arcing might occur inside the old resistor. Hence, the terminal block connection.

"Once I had the resistors replaced, the set came back to life and I moved on to alignment. The set was rather badly out of alignment and as I tuned up the IF transformers the set started to 'motorboat' really badly. This set has two IF amplifiers and, therefore, a lot of gain in the IF. I noticed the IF, mixer, and RF tube sockets were set up for shields, but none were installed. As you can see, I used some kitchen aluminum wrap around these tubes as a shield and it nicely solved the 'motor boating' problem. It really is a nice set."

Clem walked over to take a look. "If you take a walk across the alley I have a box of those Goat shields up on the second floor next to that stack of old chassis parts. One thing you will find, is those ST shaped tubes are not all quite the same length and the shields come in differing lengths. Sometimes I will find a tube that is too tall for the shield to make a good contact at the socket. To fix that, I have soldered a bit of flat brass on the bottom of the shield to extend it about a quarter of an inch. By the way, those shields in the barn have been there for a while, so you will probably want to take some Emory paper to polish up the contact area. It probably wouldn't hurt to polish around the tube socket connection as well."

Art nodded in agreement and grabbed the key for the barn as he headed out the back door. It only took him a short while to find the box of shields and carry it back to his bench. As Clem predicted, he did have to solder an extension on one of the shields. He was also surprised to discover that one of the three 6D6 tubes was, as Clem had mentioned, about a quarter inch shorter. He also noted the 6A7 was shorter than the 6D6's. The 75 tube was the same height as the 6A7.

Clem could see that Art was surprised the tubes were of slightly different

heights and offered some additional help. "Art, as you can see that set has a round connection for the shield at the tube socket and requires exactly the right shield length. Some other sets have long fingers at the tube socket to make connection and that can accommodate quite a range of tube heights with a single length tube shield. I guess you could say that is just one of the booby traps that manufactures used to keep radio mechanics on their toes."

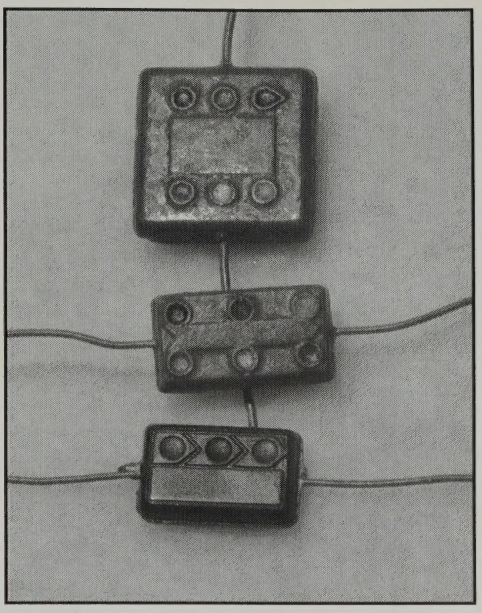
Art grinned. "And speaking of booby traps, yesterday I was working on an RCA table radio that had a leaky mica capacitor in the audio circuit. It was feeding B plus into the grid of the output tube and made for bad distortion. It was a surprise because I didn't think mica caps could be leaky like paper caps."

Clem gave Art a 'knowing' wink. "First question – right off – are you sure it was a mica cap?"

Art had a puzzled look. "Of course I am sure. It was one of those little rectangular dudes with the color dots for value."

"Art, I agree that it looked like a mica cap, but there are paper caps that are made in the same package. You have to look at the six color dots. If the first dot, in the upper left hand corner, is black or white it IS a mica cap. BUT, if the first dot is silver, it is a paper cap. So Black stands for JAN or military grade mica, White stands for EIA or commercial grade mica and Silver stands for paper. If the cap does not have 6 dots and only has 3 or 4 dots, it is certainly a paper cap. Take a look at that color code chart over there on the wall and you can see what I mean."

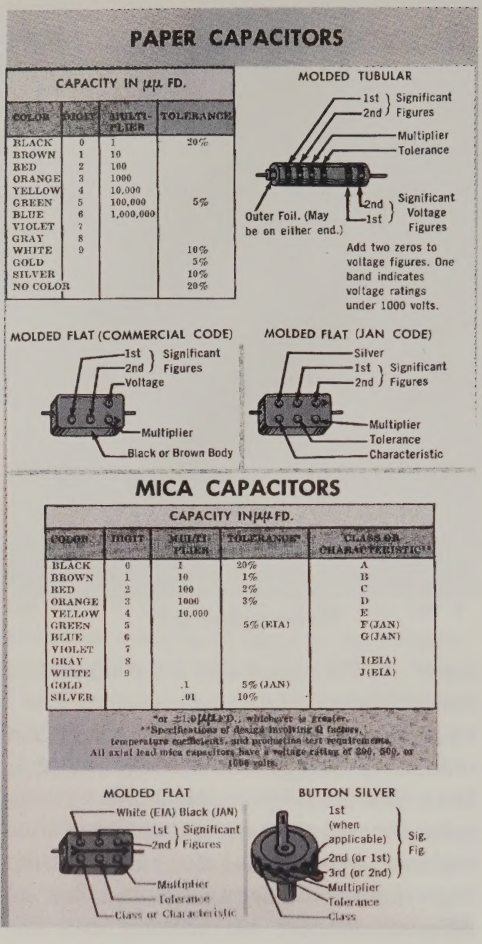
Art walked over to the chart. "Wow, I have looked at this before, usually to confirm a value but I have to admit, I had overlooked the possibility that it could be



Mica and paper caps

paper. By the way, since I am working on that old Detrola I was reminded of your tip about the color code on 'dog bone' resistors – think B E D for Body, End and Dot. The first digit is the resistor body color, the end color is the second and the multiplier is the dot. I also have noticed the values on modern resistors follow a different scheme so replacing one of these old resistors with a modern one sometimes requires just getting close. The other thing I have to remind myself as I work on some of these old sets with a Rider schematic is the 'M' on a resistor value is the Roman numeral for thousand, not the modern M for meg or million."

Clem watched Art as he stared at the color code chart. "You know, Art, even as long as I have been in this business, I still find myself checking that chart – particularly for all of the variants on ceramic capacitors. They turn up all the time in television sets and there are quite a number of variants. With ceramic capacitors not only do you have to worry about val-



PAPER CAPACITORS

CAPACITY IN μμ FD.

COLOR	DIGIT	MULTIPLIER	TOLERANCE
BLACK	0	1	20%
BROWN	1	10	
RED	2	100	
ORANGE	3	1000	
YELLOW	4	10,000	
GREEN	5	100,000	5%
BLUE	6	1,000,000	
VIOLET	7		
GRAY	8		
WHITE	9		10%
GOLD			5%
SILVER			10%
NO COLOR			20%

MOLDED TUBULAR

1st, 2nd } Significant Figures
Multiplier
Tolerance
2nd, 1st } Significant Voltage Figures
Outer Foil. (May be on either end.)
Add two zeros to voltage figures. One band indicates voltage ratings under 1000 volts.

MOLDED FLAT (COMMERCIAL CODE)

1st, 2nd } Significant Figures
Voltage
Multiplier
Black or Brown Body

MOLDED FLAT (JAN CODE)

Silver
1st, 2nd } Significant Figures
Multiplier
Tolerance
Characteristic

MICA CAPACITORS

CAPACITY IN μμ FD.

COLOR	DIGIT	MULTIPLIER	TOLERANCE*	CLASS OR CHARACTERISTIC**
BLACK	0	1	20%	A
BROWN	1	10	1%	B
RED	2	100	2%	C
ORANGE	3	1000	3%	D
YELLOW	4	10,000		E
GREEN	5		5% (EIA)	F (JAN)
BLUE	6			G (JAN)
VIOLET	7			
GRAY	8			I (EIA)
WHITE	9			J (EIA)
GOLD		.1	5% (JAN)	
SILVER		.01	10%	

*or ±1.0 μμFD., whichever is greater.
**Specifications of design involving Q factors, temperature coefficients, and production test requirements.
All axial lead mica capacitors have a voltage rating of 300, 500, or 1000 volts.

MOLDED FLAT

White (EIA) Black (JAN)
1st, 2nd } Significant Figures
Multiplier
Tolerance
Class or Characteristic

BUTTON SILVER

1st (when applicable), 2nd (or 1st), 3rd (or 2nd) } Sig. Fig.
Multiplier
Tolerance
Class

ue and Voltage rating, you also have to be concerned about temperature coefficient. Ceramic caps are used in oscillator circuits and the manufacturers will use that temperature dependent capacitance to compensate for frequency drift as the set warms up. It is a good thing that ceramic caps are so reliable, because replacements can be a bit difficult as you try to match the temperature coefficient." Art nodded in agreement.

As Art walked by Clem's bench he glanced over and noticed an interesting black meter about the size of two cigarette packages stacked on top of each other. He pointed at the intriguing object as he asked with a bit of a chuckle. "What might that be? It looks like Robbie the Robot with test leads for legs."

Clem smiled. "That, my dear boy, is a Wiggy!"

Clem's response caused Gerry to look up in interest. "OK, boss, what is a Wiggy?"

A mixed look of mock disappointment and surprise appeared on Clem's face. "You two don't know what a Wiggy is? I thought the whole world would know about Wiggy."

Both Art and Gerry looked at Clem and shrugged their shoulders.

Clem smiled as he continued. "OK, it would appear it is time to enlighten you. A Wiggy is an electrician's tool. It is a Voltmeter that is an indispensable tool for those among us who work with power distribution, particularly in an industrial plant." Clem handed the instrument to Art who walked over to show it to Gerry. The two examined it as Clem continued. "As you can see, it has a meter scale with markings on the left side for 120, 240 and 600 Volts DC. On the right side the markings are for 120, 240, 480 and 600 Volts AC. The little dome on the top has a flag that serves to indicate polarity when measuring DC Voltages. The flag is red for positive and black for negative on the red probe.

"As you can see, it is not what we would call a precision instrument but it has a number of advantages when you are working in an industrial setting. Perhaps the most important thing is that it is a good size and rugged enough to ride around in a toolbox or a tool pouch on your belt. It can always be right at hand when you want to confirm that the circuit you are working on is either the expected Voltage or is dead, and therefore safe, to work on. As you can see, the test probes slide neatly into the pockets on either side so they aren't flopping loose

as you tote it around. The test probes are quite long so they can be inserted into a plug for testing but, except for the very tip, are covered with a spring-loaded shroud. The shroud provides shock protection yet slides back easily as the probe is inserted into a socket."

Art did a bit of a double take as he slid the shroud back on one of the probes. "That is kind of slick."

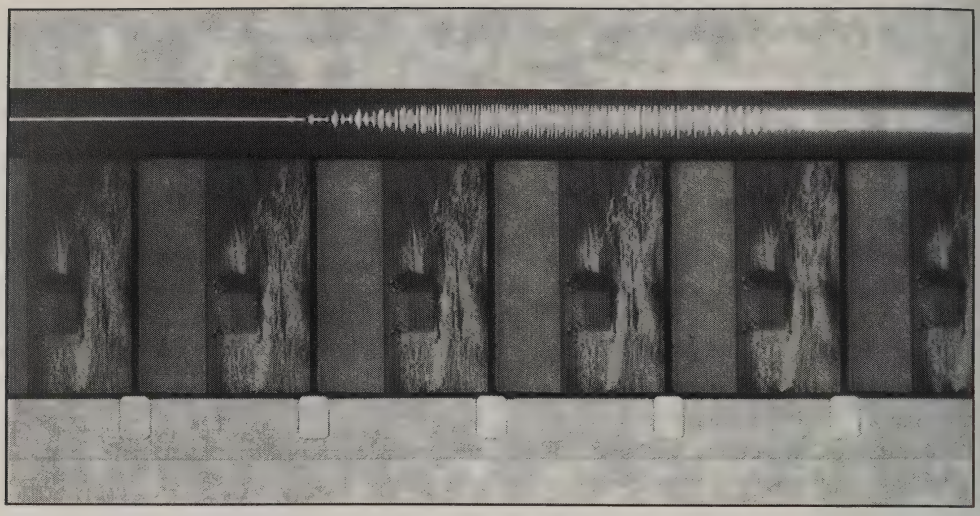
Gerry was playing with the shroud on the other probe. "So why do you have this?"

Clem was happy to continue. "It is on loan for the morning from my friend Sam who is an electrician over at the Bessemer Plant. I actually borrowed it to show you guys. It is kind of interesting to see tools of another trade that is closely related to what we do in that we both work with electricity. We both have to measure Voltage but our instruments would not stand up to the physical abuse of being carried around in that environment. For our use, the Wiggy has far too low of an input impedance. It would simply look like a short to the things we measure and the scale lacks precision. For Sam's measurements the low impedance is an advantage. Since he is measuring circuits that share conduits with other circuits, because of coupling, one of our meters would show a Voltage even when the circuit was dead. The Wiggy will show it as dead. Sam also mentioned that because of the flag for DC polarity, the instrument makes a distinctive audible click when it is connected to a hot circuit. If the location isn't too noisy, Sam claims he can tell the Voltage by the loudness and tone of the click."

Gerry and Art looked it over and handed it back to Clem. As they were walking back to their benches, it was Gerry who asked; "I noticed what look like three movie projectors with repair tags. What is the story about them?"

A Wiggy

Clem responded with some enthusiasm. "You are right, those are movie projectors. The three of them are from Centerburg High. Since our repair business tends to slow in the summer I decided projector repair might be something to try. Since school is out for the summer there is no real rush to repair them. I figure that would give us a chance to decide if we want to take on that sort of repair. As a positive thing, they each have a high quality audio amplifier and amplifier repairs are something we know how to do. They are quite mechanically rugged and straightforward so I would expect any mechanical repairs would be things like replacing drive belts and lubrication. I have ordered service literature



Movie sound track

and we should see it in the mail in the next few days."

Gerry looked a bit skeptical. "I know we work on record changers and those are mechanical so I suppose, with a diagram, we can figure out a projector. What else do you think we might find that is new?"

"Good point, Gerry. I can tell you a few things I already know. As I said, the audio amplifier in those projectors is high quality. It has a push-pull pair of 6L6 output tubes with a big transformer so the output is on the order of 20 Watts or more that is connected with cables to one or two high quality 12-inch speakers in nice portable enclosures. The speaker enclosures have a lift off suitcase type back and have space for a spare take up reel and cable. As I said, the amplifier circuitry should be quite familiar to us. What is not familiar is the audio source since it comes from the film rather than a record or magnetic tape.

"The sound track is recorded on the film on the edge of the film opposite the sprocket holes. It is optical and is quite visible to the eye and appears as a clear line in a black background. The width of the line varies in proportion to the signal strength. To recover the signal, the projector uses a razor thin line of light across the sound track and the light that passes goes to a photoelectric tube. The output of the phototube is amplified for the sound. To create that thin line of light the projector uses what is called an exciter lamp. This is a specialized lamp bulb with a nice straight filament running along the axis of a small tubular envelope. A small round cylinder of glass is used as a lens to focus the light into a nice straight line. The important thing to keep in mind is that the exciter lamp must have pure DC on its filament. If the lamp had AC on the filament, you would hear the hum. In those projectors, a third 6L6 is used as cathode follower Voltage regulator for the exciter lamp.

"In the projector, the film is mounted on a top supply reel and is routed to the first sprocket above the lens. From there it makes a loop down into the guide, or gate, behind the lens. From there it goes through another loop to the second sprocket under the lens. The loops are critical because the sprockets turn at a constant speed but in the gate the film is

advanced one frame at a time and the loops allow for the jumping motion. From the second sprocket, the film passes over a roller guide and is then routed around the sound drum. The exciter lamp and its round lens is above the drum and there is a mirror inside the drum to direct the output light to the phototube inside the body of the projector. The sound drum rolls with the film and is connected to a heavy flywheel to make sure there is no flutter in the sound. After leaving the sound drum, the film is routed through a third sprocket and guides to the take up reel.

"By the way, the projector plays a trick on your eyes. The sound film runs at 24 frames per second and as the film is advanced a shutter behind the gate shuts off the light when the film is advanced. That way you don't see a vertical smear on the screen when the film advances. The interesting thing is that 24 blinks per second is quite perceivable for most people. In fact, it tends to drive you crazy. However, in the projector, the shutter has three blades and the light is interrupted three times per revolution and the film advances on the third blink. Thus the screen is actually blinking 72 times per second and no one I know of can perceive that blink due to persistence of vision. The shutter wheel is in a cylindrical housing between the lamp housing and the gate.

"And speaking of the projection lamp. Projection lamp bulbs are quite specialized and on the pricey side. It is a 750-Watt bulb in a fairly small package. The filament is stacked into a plane to provide uniform light. Because of the high power and small envelope, the lamp must be force air-cooled and the projector includes a cooling fan. In fact, without the fan, the glass would melt. These bulbs run the filament at a very bright white and, therefore, have a relatively short 50-hour life. I might mention the exciter lamps also have a fairly short 200-hour life so if we get into this business we would have to stock projector bulbs. I suppose with the popularity of home movies, it might not hurt to have a stock of projector bulbs for our customers anyway. I don't think anyone else in Centerburg has them and it is a long drive to the nearest photo store.

"Movie projectors use a centrifugal speed governor not unlike the Mixmaster in your kitchen, so I think we can deal with that as well. The optical paths in the projector will have to be cleaned and that includes the mirror and lens for the projection lamp behind the gate as well as the projection lens itself. The lens and mirror for the sound drum will have to be cleaned as well as the photo tube itself. So what do you guys think?"

Art and Gerry both responded with a grin and a thumbs-up. Clem took a look at his watch and commented. "Wow, I had better get back to work. I have to deliver this TV chassis and I said I would be there in half an hour so I need to get a move on." Gerry turned back to his alignment chores. Art returned to his bench to finish the alignment on the Detrola. Clem loaded the chassis on the handcart and went out the back door. Darcy got up from her desk to greet the first walk in customer for the day. The shop was well underway for the day.

I sat back in my chair, enjoyed the warm breeze coming in the window and decided that it was time to refresh my coffee.

The Captain Midnight Radio Program

By Brian Rogers

John Dunning, in his "The Encyclopedia of Old Time Radio," says that the Captain Midnight program was a "juvenile aviation adventure serial" that ran from October 1939 to December 1949.

Maybe so.

But to me, who turned ten in 1947, Captain Midnight's Secret Squadron was a never, and I mean NEVER-to-be-missed radio show. It required me to be in my bedroom at 5:30 every afternoon with the door closed and the tubes of my Philco Model 90 cathedral warmed up and ready.

1945 Magnifier Dial

When I heard a church bell's bonging followed by the high-pitched whine of a diving piston-engine airplane, I knew I'd tuned in on time.

The Model 90 had been a wedding gift to my parents in 1934. I had inherited the set when they replaced it in our living room with a Sears Silvertone console.

Sponsored by Skelly Oil, Captain Midnight began on WGN in Chicago. Initially, the program was recorded on 16-inch glass discs at the advertising agency of Blackett, Sample and Hummert. It was created by Robert Burtt and Wilfred Moore, World War I pilots, who also created The Air Adventures of Jimmie Allen, another Skelly Oil sponsored program.

The Skelly sponsorship was, at best, awkward, because it depended on kids telling their parents to go to a Skelly Oil station and buy gasoline or have their oil changed. The show did not run nationally; it was heard only in markets where Skelly prod-

Captain Midnight Insignia

ucts were sold—primarily the Midwest and South.

By 1940, the show's listenership had grown and it was time to go national. It was picked up by the Mutual network where it remained until 1942 when it moved to NBC Blue. When the FCC forced NBC to divest its Blue network, the sponsor, Ovaltine, moved Captain Midnight back to Mutual.

Ovaltine had begun its sponsorship of the program in 1940 when the milk

additive chocolate powder ceased sponsoring Little Orphan Annie. If you're a fan of the movie A Christmas Story, you may recall Ralphie at his Code-O-Graph decoding a message from the Orphan Annie program that disappointed him when he discovered its content was merely "Don't forget to drink your Ovaltine."

The yearly Code-O-Graphs became a mainstay of the Captain Midnight program. An annual event at our house was me carefully removing the paper label from an Ovaltine jar and laboriously printing my name and address with a pencil in capital letters on the label's inside. It was then mailed and I waited eagerly for the arrival of my Code-O-Graph. One year the Code-O-Graph was on a badge, another on a whistle. According to Dunning, the Captain Midnight character was World War I flying ace Capt. Red Albright who had returned at midnight from a perilous mission.

Helped by young assistants Chuck Ramsey and Patsy Donovan, who later was known as Joyce Ryan, Captain Midnight fought an assortment of 1940s-era evil doers, including Nazi and "Jap" spies and the always nasty, bent on world domination Ivan Shark and his daughter Fury.

Captain Midnight's mechanic was Ichabod Mudd, nicknamed Ichy. I always pictured the name as "Icky Mud" and thought it hilarious.

Winter show set's new all-time attendance record!

By Mark Oppat

The Winter "Vintage Electronics Expo" held at the Costick Center in Farmington set an all-time attendance record—well over 1100 in the door and a sell-out of approximately 130 vendor tables! This is almost three times what we were drawing five years ago. It appears the re-branding of this event and the marketing thru the Metro Times and on WDET-FM radio as well as promo cards dropped at most area pubs, libraries record stores, resale shops and bulletin boards within a 25 mile area seems to be working .

This show featured two great "Silent Auctions", an "Amp Clinic" by Muse Audio of Ann Arbor, and we had a great seminar from past MARC President John Reinicke on record players. The "Bargain Auction" at the end of the show brought in nearly $900, also a record for this show. If you missed the show, search on YouTube for "2019 Vintage Electronics Expo", where there is a nice video shot by Terry Dayton of D-Labs in Battle Creek area. Terry and his wife Marcia (and even granddaughter "Short Wave Girl") have shot videos of our "Extravaganza" July shows for many years, and you can also see those videos on YouTube if you search for "Extravaganza MARC" and pick any year from 2011 to 2017. 2015 was our first year at Kalamazoo Expo Center; the previous years were in Lansing, outside. Don't miss the summer VEE there July 19-20, it should be another great show! See the other articles about that in this Chronicle.

Silver Migration

By Edward Dupart

Awhile back I picked up a Zenith transoceanic 6A40 that was very clean inside and the cabinet just needed cleaning and the price was right. When I got it home and plugged it in it sounded like a thunderstorm with lots of loud crackling. I knew at once it had a bad IF transformer due to silver migration. Anytime I hear about silver migration, I think of bad IF transformers. For those that aren't familiar with the term silver migration it is the movement of silver across an insulator and creates a short. There a lot of people out there that have heard the term silver migration and immediately think of bad IF transformers, but really don't understand what's going on inside that transformer. And there are those that are new to collecting old radios and should know more about it. So I'm going to attempt a simple explanation of what's going on inside those transformers.

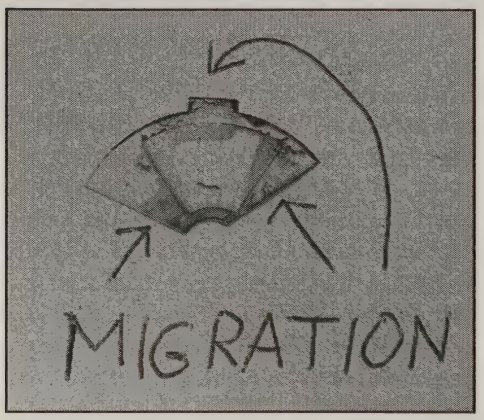
Silver migration was a common problem to GE (General Electric) and Zenith radios of the 1950's and early 1960's. Anytime someone brought in a GE radio into the shop, I could almost automatically assume it had bad IF transformers without even plugging it in. It became a game to see if I was right or not. The owners of the shop kept a good supply of inexpensive Japanese replacement IF transformers in stock, and it was by far cheaper to replace the transformer, rather than try to repair the old transformer. The Japanese transformers worked superbly. Other brands were afflicted with this problem too, but not to the extent that GE and Zenith experienced it. Recently I repaired a 1955 Motorola with a bad IF transformer that had the silver migration problem, but I simply replaced the transformer, it was quicker and easier. Silver migration is also a problem in other areas of electronics dealing with printed circuit boards and IC's (integrated circuits), but I won't say much about them.

So, what's inside an IF transformer and what does an IF stage do for a radio? The IF stage increases the gain of the radio, which in turn increases the sensitivity of the radio and the IF stage is set at a specific frequency, usually 455 kHz which maintains a constant Q, which means the bandwidth stays the same. For AM radio it is 10 kHz, +/- 5 kHz. This eliminates the problem TRF receivers had where their selectivity changes across the dial allowing a powerful station to bleed into a neighboring station, making it impossible to listen to the weaker neighboring station. In my area our local station at 1230 kHz makes it difficult to listen to WOWO at 1190 kHz when using a TRF or crystal radio. There are ways to reduce this problem, but not in this article. So, the IF stage gives the radio good selectivity and gain.

The IF transformer typically consists of two resonant circuits, consisting of a capacitor and a coil, mounted on one coil form and fairly close to each other to allow for transformer action, where AC (RF) voltages will transfer from one winding to the other. Most early IF transformers have two variable compression capacitors located at the top of the IF transformer housing, commonly called an IF can, with two holes to allow for adjusting the capacitors to the specified IF frequency. These early IF transformer were pretty reliable and the alignment didn't drift much, if at all. I have worked on many old radios and I would touch up the alignment and it is amazing how many were still in perfect alignment.

The early IF transformers were ra-

ther large and were as big as the tubes they were next to and the manufacturers wanted to reduce the size so they could make the radios smaller. The variable compression capacitors took up quite a bit of space, so if they could get rid of those then they could shrink the size of the IF transformer. In a tuned circuit either the coil or the capacitance can be adjusted to change the resonant frequency, so what they settled on was to make the transformer permeability tuned with adjustable ferrite iron slugs that would go up and own inside the coil form, one slug for each coil. The capacitors used were fixed and could be ceramic or molded mica. Some of the newer transformers the capacitors were sandwiched in the

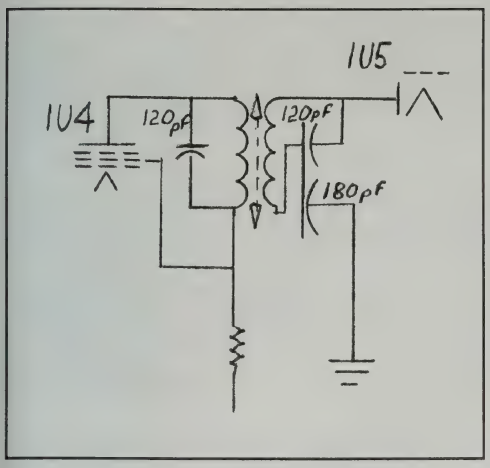


plastic bottom housing and were prone to breaking down and this is what I remember GE using. Permeability tuned IF transformers resulted in highly efficient, smaller transformers; just look inside a transistor radio.

Zenith's permeability tuned IF transformers used in the later Zenith Transoceanics and table radios used a circular piece of mica with silver plated on both sides to create two to three fixed capacitors. These are the transformers that have the silver migration problems. I used to think that metals were fixed and if they were plated on something it would stay there, but I was wrong. Silver likes to creep and go places, especially if it is subject to high humidity and voltages. This process is called metallic electromigration and is an ionic process. There are three stages to what is happening: 1. Oxidation or dissolution at the anode, 2. Migration through or across the insulator, 3. Reduction or deposition. The positive charge at the anode combined with moisture (humidity) will cause the silver to ionize and its reduction will cause brownish staining at the anode. The silver ions that make it to the cathode will deposit silver there and produce dendrites that look like branches of a bush or tree and filaments that look like needles.[1] It is this buildup of filaments and dendrites that eventually make it to the anode and create a short and cause the crackling sound in the radio. What amazes me is these dendrites and filaments will go through the insulator and across it, but the moisture will create low resistance paths for this to happen.

One of the reasons silver is used is because it is inexpensive, but the silver migration is a real problem. One way to halt or reduce this migration is to add Palladium (Pd) to the silver, which increases the cost.[2] I don't know for sure, but I don't think they added Pd to the silver in IF transformers. If anybody knows for sure let me know.

Let's take a look at the schematic of the IF transformer in the Zenith and determine what is the anode and what is the cathode. B+ goes to the lower end of the primary winding and the top end of the primary winding goes to the plate and is around 80 volts on both. So I would consider the positive potential to be the anode. The secondary has two capacitors, the upper one is for resonating with the secondary at 455 kHz and the bottom capacitor is a bypass capacitor to filter unwanted RF to ground. This grounded side of the capacitor would be the cathode. Unfortunately I didn't take a



picture of the whole capacitor, just the plate side of the capacitor that was definitely bad. At the time I didn't even think about writing anything about this and by the time I did I had the radio already back together and working. So we can take a look at the plate capacitor and the brownish stain is very evident going to the next capacitor that was at ground potential and to the screw that held everything together. I tried to scrape off the staining and to no avail; it was through the mica. I was hoping that I could scrape it off and make the capacitor work again, but no way. The secondary winding capacitors have no major voltage potentials to speak of and so I didn't see any dendrites, filaments or staining. I checked it with a capacitor checker and an ohmmeter and it checked out fine.

You are probably wondering why I had a picture of just part of the capacitor. Most people that repair these transformers rip out the entire mica capacitor and I thought I would try something different. Since the secondary side checked good, why not leave it in the transformer and just cut out the bad section? That is what I did. I took a pair of scissors and chop-chop the bad section was gone.

The way the Zenith transformer is made is that fairly round pads are part of the terminals that go through the bottom of the transformer where the wires are connected. The round pads make contact and sit on top of the silver pad that's is on the mica insulator, one pad for the bottom and one pad for the top. A screw goes through the middle of this sandwich and keeps it altogether ensuring a good connection between the round pad and the silver mica plating. The resonant capacitors are about 120pf and the bypass capacitor is about 180pf and that's about what I measured on the two good ones I had that went back in the radio. Since I cut out the old capacitor I had a choice, cut out the two round pads or put a piece of paper or plastic between the pads. I used plastic, because it won't deteriorate with high humidity. The plastic did form a new capacitor of about 40pf and the radio did work, but wasn't very sensitive and the plate winding would not align, which I already knew, but I was experimenting. What I needed was another 80pf. I didn't have the closest value of 82pf, but I did have a 68pf and the radio played much better with that. The plate winding started to align, but the slug was at one end as far as it would go, so I knew I still needed another 20pf, which I did have. I put that in parallel with the 68pf capacitor, which gave me about 88pf and that was good enough and the plate winding aligned real well and the radio worked great. My new capacitor was not in the IF can, but under the chassis.

There are various ways of fixing a bad IF transformer with silver migration. Some cut out the round pads and put the new capacitors inside the can; some install the capacitors under the chassis. Some put compression trimmers underneath and can align the radio with the ferrite slugs and the adjustable compression capacitors. And there was my method, which worked quite nicely.

(Continued on page 22)

Tube Collectors Association Closing Shop

TCA is folding its tents at the end of this year. John Reinicke asked TCA president Ludwell Sibley to share his thoughts about the organization. The following is Lud's response.

The idea of an association came from the legendary collector Al Jones, who was friends with Bob Deuel (our first and final secretary-treasurer). They were about 100 miles apart. Deuel, about the time I moved from NJ in 1999, suggested me as editor. Al was the first president for a few years.

We set dues at a modest rate ($20/yr., still standing despite 20 years' inflation). We incentivized stable, multi-year memberships by giving discounts for two-and three memberships. The result was 60% or so of multi-year signups, which saves the members the work of yearly renewals and saves the treasurer renewal traffic.

We have always used first-class mail, liking the speed of delivery (but also not having the 500 members to qualify for bulk rate).

We've been blessed with a high percentage of foreign memberships, 16% (vs. 8% for a large wireless association in its golden years).

PayPal came along at the right time. It saves the foreign members the trouble of money orders, and lets the treasurer go the Post Office less often.

We, Like MARC and also MAARC, have enjoyed the ease of doing color covers. No more hassle of transparencies or separations. Just hand the thumb drive with the images to the printer.

Early on, Al proposed establishing a tube museum. That would've probably been affordable (an old Grange Hall was for sale across the road from me), but it just didn't seem to be a big enough draw. The guy trying to establish such a museum in Denver has struggled for 3 or 4 years but just hasn't succeeded. Incidentally, as far as can be figured, Manhattan College has snuffed the wondrous multi-panel Dowd Collection displays in the reading room of its Engineering Library, with the tubes now showing up on eBay. (No hint of Dumpsterization so far.)

We tried to do what "Antique Radio Classified" did - "perpetual" availability of back issues. A few early years have finally gone extinct this year. We used "year" packages rather than offering individual issues. That was a pain with AWA back issues, which were ordered, not on a "onezies-twozies" basis, but on "zeroezies-onezies."

"Special Pubs" have been offered, usually one per year. Those have been "targets of opportunity," sent to members on a no-charge basis. They included a reprint of all the newsletters sent to the old '70s AWA tube group, and W. C. White's never-published history of electronic development at GE, and Danial Stocks' utterly new study of Carcinotrons.

E-mail also came along at the right time. It's been years since an article has come in here in physical form, from American or foreign writers.

We've lucked out as to the Web site. Norm Wilson built a remarkable reference library in it, with a search engine reaching out to tube-data sites "everywhere," and with tube data obtainable nowhere else. (He swapped Eimac data sheets with the CPII staff that they no longer had, and got some similar treasures from them.)

Ron Lawrence had the idea of establishing the email reflector 12 or 15 years ago, similar to the reflectors that he built up for AWA and the CCA-AWA group. Ours has had an occasional drunk or loudmouth, but the intellectual depth is outstanding.

Anyway, that's my claim to TCA's history. Enjoy!

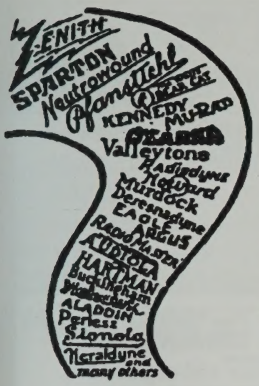
Haw! I forgot to boast about the Data Cache. Jim Cross talked the EIA out of 40-some years of CD-ROM registration records on about 7000 tubes and 18,000 semiconductors. EIA had never had a complete index to them, so Jim organized a group to open a zillion files and write up a complete index, which he shared with them.

(RMA/EIA releases were not literally public records – they went to members, and were mostly data sheets that were published, but there is a fair amount of internal correspondence, including protests against a change in a particular type.)

I, at the time, held the Dowd Archive (returned to AWA after they had built indoor Museum space to store it), and had the RCA Product Management files on 4000 tubes commercially scanned. (It took 4 days to pull the staples.)

Anyway, the Data Cache is a wondrous resource on all manner of tubes, and has been bought by maybe 100 users. It was just magic in fixing up the data in the future "Tube Lore II."

The Classified Ads



As a MARC member, you are entitled to one FREE posting per issue. Please e-mail your ad to the address below, or snail-mail a legibly written ad to: Steve Enzer, Editor, MARC Chronicle, 12740 Monroe Pike, Brooklyn, MI 49230. E-mail: enzer@binsys.com.

Please note that ads for the Fall issue are due by August 1st.

REPAIR SERVICE: I repair all tube type radios. I have most parts and tubes in stock. Dan Schnaidt, 325 Milton Ave., Battle Creek, MI 49017, 269-282-1324 (home), 734-417-6995 (cell).

FOR SALE: ARBE-III, Universal Battery Eliminator, $159.95 + $15 S/H. Michigan residents, please add $9.00 sales tax. The ARBE-III is designed to provide the power requirements for most pre 1930's battery operated radios. The custom wound power transformer provides 3 electrically isolated supplies (A, B, C) which are all regulated and short circuit proof. Comes assembled, tested and with a full five year warranty. Please refer to our website at www.arbeiii.com for direct purchase using PayPal. You can contact me at 517-787-2985 for details on money order or personal check payments. We are also offering custom wound audio transformers for early radios. $19 each or $20 each for the center tapped version plus S/H. See our website for other items offered. You can reach me at arbeiii@yahoo.com.

FOR SALE: PARTS! We have a full stock of radio supplies, including capacitors, tubes, knobs (including our two types of real wood repros!) , bulbs, tube shields, etc. Our two specialties: repro radio dials (we bought the former Clint Blais repro dial business in 2003, and they are still the best!) and we can duplicate or repair most old volume or tone controls. Phono needles, carts and wheels too. Email any wants or see our website at www.oldradioparts.net Over 30 years servicing radios here! Mark Oppat mop-pat@comcast.net 253 Blanche St, Plymouth, MI 48170 734-455-4169 11am-9pm most days.

FOR SALE: 1% Precision tolerance 500V silver mica capacitors and **1% Precision** 630V tubular axial PSA polystyrene film capacitors. Also for sale are 1000 Volt silver mica capacitors available in many different pF sizes. All capacitors are new production. For price list and product info, please contact Dave Cantelon, 6 Ferncrest Gate, Scarborough, Ontario, Canada, M1W 1C2 ; phone 416-502-9128; Email: justradios@yahoo.com or visit WebSite: www.justradios.com

FOR SALE: – Repro Antique Radio Dial Covers – Mark Palmquist - Retro Radio Repair www.dialcover.com 5033 Arbor Ln, Lilburn, GA 30047 (770) 923-8929 jmpalm@mindspring.com.

FOR SALE: Phono and tape recorder wheels, belts. Phono needles, cartridges, 45 adapters, centerposts for all brands. Our specialty: massive inventory of V-M Factory Service parts, manuals. Also buy same for stock. Visit www.thevoiceofmusic.com or email info@thevoiceofmusic.com with what you have or what you need. Phone (248) 478-0990 before 7pm weekdays, Saturday until 2pm. Gary Stork, 37530 E. Meadowhill, Northville, MI 48167

FOR SALE: Radio grommets, washers, and other rubber parts, repro knobs, push buttons, NOS and repro clock radio knobs, Motorola VT71/73 T.V. masks and

knobs, and more. See them all at www.renovatedradios.com. Ed Schutz: blacksmith@renovatedradios.com (586) 697-6153.

FOR SALE: 1955 Lowery Double Key Board Electric Organ with beautiful Mahogany Cabinet, 55 tube unit, very powerful in its day, $400.00 selling as is. Variety of older ham tube equipment. Quite an assortment of ham magazines, 1970-1990s. Battery radios from 1920s, no horns but complete. Variety of transmitting tubes: 807, 866, 832, 815 etc. Portable Bakelite and wooden TVs early 1950s. WANTED: Kennedy console or table model radio. Can be rough needing work or restored if price is right. Phone Gary Clayton, The Olde Tyme Radio Centre, Belgrave, Ontario, Canada NOG 1E0, 519-357-4304, oldetymeradio@tnt21.com, http://www.oldtymeradio.ca/.

FINDER'S FEE: I am willing to pay a $100 finder's fee to the first person who can provide me the whereabouts of the Reuben Smith 5-tube TRF battery radio with a glass front panel (circa 1925) manufactured in Lansing, MI that I traded off to the late Oran Sauder of South Lyon, MI perhaps 25 or more years ago. Jim Clark, 517-648-2785 or jc072651@aol.com. Thank you.

WANTED TO BUY: Your old capacitors, new or used (prefer with leads). All types: Wax, plastic, molded, striped, metal shell, disc, etc. These can be from your radio restorations, junk box, or vintage 1940-70s new old stock. Will pay shipping as well, or I can pick up in Kalamazoo at Expo 2017. Dan Gutowski 734-718-7450 email: dg16ms26@msn.com.

(Silver Migration, continued from page 19)

References:

1. Metallic Electromigration Phenomena by Simeon J. Krumbein AMP Incorporated, Harrisburg, Pennsylvania 17105 pg. 6
2. Silver Migration-The Mechanisms and Effects on Thick Film Conductors by Kim Vu San Jose State University pg. 19
3. Silver Migration-The Mechanisms and Effects on Thick Film Conductors by Kim Vu San Jose State University pg. 9
4. Metallic Electromigration Phenomena by Simeon J. Krumbein AMP Incorporated, Harrisburg, Pennsylvania 17105 pg. 5 & 9

For those that want to see the chemistry behind silver migration.[3]

$Ag \rightarrow Ag^+$ silver ionized as a result of water (humidity)

$H_2O \rightarrow H^+ + OH^-$ hydrogen migrates to the cathode and is released as a gas.

$Ag^+ + OH^- \rightarrow AgOH$ which is colloidal precipitate and is unstable and it decomposes to form Ag_2OH which deposits a dark deposit around the anode.

$2\ AgOH \quad Ag_2O + H_2O$

$Ag_2O + H_2O \rightarrow 2\ AgOH \rightarrow 2\ Ag^+ + 2OH^-$ A hydrate reaction takes place. At this point Kim Vu doesn't state the silver ions (Ag^+) go to the cathode, but I believe they do and they form the dendrites and filaments. Simeon J. Krumbein says they do and to see more about this visit his work.[4]

THE OLDE TYME RADIO CENTRE

"ANTIQUE RADIOS SOLD & RESTORED"

Vintage Auto Radios & Clocks Repaired

Gramophones, Antique Clocks, Telephones Sold & Restored

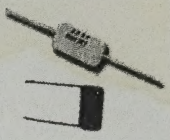
Gary Clayton *"Visit our Showrooms"* *Nellie Clayton*

Hwy. 4, 9 Queen St., Belgrave, Ontario, Canada N0G 1E0

519-357-4304 email: oldetymeradio@tnt21.com

website: www.oldtymeradio.ca *Philippians Ch: 4-13*

Just Radios



Capacitors & Resistors for Tube Radios

David and Babylyn Cantelon
6 Ferncrest Gate, Scarborough
Ontario, Canada, M1W 1C2

www.justradios.com
justradios@yahoo.com
(416) 502-9128

V-M Music The Voice of Music®

® REGISTERED TRADEMARKS LICENSED FROM V-M CORPORATION

V-M AUDIO ENTHUSIASTS

37530 E. Meadowhill, Northville, MI 48167-8915

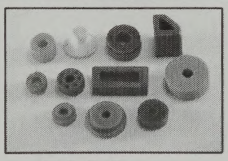
www.thevoiceofmusic.com

V-M PARTS & MANUALS • IDLER WHEELS • NEEDLES / CARTRIDGES
45 ADAPTERS • CENTER POSTS • MOTOR MOUNTS • BELTS

Gary Stork • info@thevoiceofmusic.com • (248) 478-0990

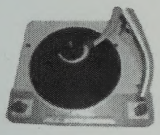
WWW.RENOVATEDRADIOS.COM

* GROMMETS *
PUSH BUTTONS
CLOCK KNOBS



REPRO KNOBS
BOOKS ON CD
RADIOS

Ed Schutz
(586) 876-9802
blacksmith@renovatedradios.com

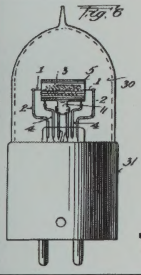


VM Electronics
of Michigan

Expert Servicing
Since 1973

Specializing in
V-M . Garrard . Magnavox
and most makes and models

David Ziolkowski
6880 Crestwood, Dearborn Heights, MI 48127
Email: dziolk1957@yahoo.com Ph: (313) 410-4547



JIMCO Tubes Pty Ltd.

Mike Dale
3464 Judd Rd.
Milan, MI 48160
MDALE8@PeoplePC.com
(734) 439-0834

We Buy and Sell Tubes!

Paid Ads Accepted

The *Chronicle* accepts paid **business card sized ads**. The ad may be in the form of your business card, or other text/graphics of business-card size. All submissions must be camera-ready. We will not do any typesetting, but simply copy what you send us. Also, your ad can appear on the MARC website at no extra charge.

Rates: $10 per single issue, $35 per year (four issues).

Please send all submissions to:
Steve Enzer, MARC Chronicle Editor,
12740 Monroe Pike, Brooklyn, MI 49230
Enclose a check for correct amount payable to MARC.

Call for Articles

Your editor is always looking for new articles. Many of our readers have indicated a preference for articles related to collecting, as opposed to highly technical pieces. Of particular interest are personal accounts of a particular restoration you might have done, or historical accounts related to our hobby. But all subjects related to vintage electronics are welcome.

If you have an idea please feel free to discuss it with me, either by phone or email.

Steve Enzer, MARC Chronicle Editor, enzer@binsys.com. 517-592-2841

Extravaganza '19—The Summer VEE

What's NEW...

By Mark Oppat

Since moving to the great Kalamazoo Expo Center in 2015, this summer "Vintage Electronics Expo" has been one of the best shows of this type in the USA. It's truly a great "Extravaganza" of vintage electronics!

Following the record turn-out for the Winter VEE, we are calling on our MARC members to help spread the word about this summer show. Be sure to post about this event on any "social media" you may frequent, and "Like" the club's Facebook page too. It's often the personal connection that makes the difference, so be sure to invite friends to discover the joy of vintage radio, audio, video and related devices we have on offer. Vintage car fans will note the nearby Gilmore Car Museum is another attraction just 30 mins away.

Besides having over 20,000 square feet of air conditioned indoor flea market, we are now offering OUTDOOR spaces for those who prefer to pile their stuff under the sky. See the new registration form for info on the website or the brochure for info on that.

Note also, this is the ONLY vintage electronics show where you can drive up in an RV and hook up as well! Just get a permit from the Expo Center (again, see the event site or the brochure). There are 6 motels nearby too, in all price ranges (MARC has a special $112 deal for "single king" or "double queen" bed at the Four Points by Sheraton until June 17, so hurry if you want in on that).

No question, some of our long time collectors are passing on or disposing of their extensive collections. There was one such estate lot at the Winter VEE that really drew attention. We expect some larger estate lots will show up in the flea market and auctions. Longtime MARC member John Den Hartigh cleared out a very large hoard earlier this year and will have a huge selection from it at the Expo.

We have shuffled some rooms too, the seminars and Silent Auctions will now be in the Expo North room which will make them easier to access through the lobby. The contest theme, "Records and Players- the Music Goes 'Round" should be fun as well as attracting new collectors into the vast vintage world of recorded sound. See the event flyer for contest categories and bring out your best stuff!

So all the MARC volunteers have made every logical effort to make this the best show possible and we hope you will agree, come out and enjoy our summer Extravaganza!